

REMARKS

Reconsideration and allowance in view of the foregoing amendments and the following remarks are requested. Claims 1-23 were pending in this application. By this amendment, Applicants have amended claims 1, 9, 10, 11, 17, 18, and 20 and added new claims 24-31. Claims 2 and 8 are cancelled and their limitations incorporated into claim 1. Claim 14 was withdrawn as being directed to a non-elected species. Thus, claims 1, 3-7, and 9-31 are pending in the application. Support for the amendments can be found in the original claims. No new matter has been added by the amendments. Applicants respectfully request reconsideration of the claims.

The Examiner's claim suggestions have been incorporated into amended claims 9, 10, 11, 17 and 18.

The Office Action objected to claim 12, however claim 12 does not recite the language quoted therein. Applicants assume that the Examiner was referring to claim 20, which has been amended according to the Examiner's recommendation. Accordingly, Applicants request the objection be withdrawn.

Claims 1, 3, 5, 13, 15, and 19-23 were rejected under 35 U.S.C. § 102(b) as being anticipated by WO 00/44061. The Examiner asserts that U.S. Patent 6,709,789 to Hambitzer et al. ("the '789 patent") is an English equivalent of WO 00/44061. Applicants respectfully traverse the rejections on the grounds that the '789 patent does not teach and every element of the claims.

The '789 patent and the present application describe similar types of inorganic battery cells using an SO₂ based electrolyte with Li as the preferred active metal and a positive electrode containing an intercalation compound, preferably a LiCo and O₂ compound. In addition to having a similar structure, both address a problem with safety of electrochemical battery cells, particularly with respect to hazards of fire and explosion.

While the '789 patent and the present application involve similar technologies and address the same problems, the present invention takes a fundamentally different approach than that of the '789 patent.

The '789 patent teaches the use of a salt as an ingredient of the cell, with the salt being arranged such that it is in contact with the active mass deposited on the negative electrode. ('789 patent, claim 1). The salt, used as described in the '789 patent, has several important effects including: (1) impacting chemical reactions of the salt with critical compounds generated in the cell ('789 patent, Col. 1, Lines 65-66); (2) melting of the salt (at relatively low temperatures) for withdrawing the heat of fusion ('789 patent, Col. 2, Lines 13-20); and (3) shifting of the equilibrium of chemical reactions ('789 patent, Col. 2, Lines 21-26).

Conversely, the present invention includes providing a particular microporous structure that is arranged in direct contact with the electrically conductive substrate. The effect of the microporous structure is not based on any type of reaction or physico-chemical interaction but only on its mechanical properties (such as pore size and dimensions). Details of the suitable microporous structure are explained on pages 7 to 9 of the specification of the present application.

Independent claim 1 has been amended to more accurately reflect the fact that the advantages described in the specification are a result of the physical nature of the microporous structure and not the chemical properties of the salt. In particular, amended claim 1 includes limitations requiring that "the porous structure is determined by the size and shape of structure-forming solid particles, the material of which is not an ionically dissociating material" (i.e., not a salt) and "the volume of the solid particles in the porous structure is at least 40%." Neither of these limitations are disclosed by the '789 patent.

The limitation that "the volume of the solid particles in the porous structure is at

least 40%" was incorporated from dependent claim 2, which has thus been cancelled. In rejecting claim 2 as obvious under 35 U.S.C. § 103(a) over WO 00/44061, the Examiner asserted that, although this feature is not found in the '789 patent (the English equivalent of WO 00/44061), "it would be obvious to adjust the porosity of the salt and/or ceramic particles so that a sufficient amount of lithium active mass is able to form on the substrate." As noted in the present application, however, it would have been expected that such close packing (resulting in narrow pores) would result in a detrimental increase in electrical resistance and thus a reduction of the maximum charging and/or discharging currents. (Present Application at page 4). Furthermore, before the present invention, it was believed "[t]he reduced mobility of the electrolyte ions gives rise to a concern regarding the formation of a concentration gradient, which would lead to a voltage drop." (Present Application at page 4). The fact that a person having ordinary skill in the art would have expected a volume proportion of solid particles in the porous structure of 40% or higher resulting in narrow pores to yield detrimental effects, indicates that this feature of amended claim 1 (formerly claim 2) would not have been obvious to a person having ordinary skill at the time of the invention.

Thus, Applicants respectfully submit that the '789 patent does not and can not anticipate each and every element of amended claim 1.

Claims 3, 5, 13, 15, and 19-23 depend from amended claim 1 which, as explained above, is believed to be allowable. Thus claims 3, 5, 13, 15, and 19-23 are believed to be allowable as depending from an allowable base claim. Accordingly, Applicants request that the rejection be withdrawn

Claims 2, 4, 6-10, and 16-18 were rejected under 35 U.S.C. § 103(a) as obvious over WO 00/44061 in view of "knowledge of a person having ordinary skill in the art." Claims 4, 6, 7, 9, 10, and 16-18 depend from amended claim 1 which, as explained

above, includes subject matter not disclosed by WO 00/44061. The knowledge of a person having ordinary skill in the art does not remedy the above-described deficiencies in WO 00/44061 with respect to claim 1. Thus, the combination of WO 00/44061 in view of the knowledge of a person having ordinary skill in the art fails to disclose or suggest each and every element of claims 4, 6, 7, 9, 10, and 16-18, and the rejection of those claims is improper. Applicants request that the rejection be withdrawn.

Claims 11 and 12 were rejected under 35 U.S.C. § 103(a) as obvious over WO 00/44061 in view of U.S. Patent Application Publication 2002/0102456 to Aihara et al. Claims 11 and 12 depend from amended claim 1 which, as explained above, recites subject matter that is not disclosed by WO 00/44061. Aihara et al. fails to remedy the above-described deficiencies in WO 00/44061. Thus, the combination of WO 00/44061 in view of Aihara et al. fails to disclose or suggest each and every element of claims 11 and 12, and the rejection of those claims is improper. Accordingly, Applicants respectfully request that these rejections be withdrawn.

Furthermore, Aihara et al. describes the use of inorganic filler/particles together with a polymer for forming a solid layer between an electrode and a separator. The filler makes the layer porous whereby it can be penetrated by an electrolyte and thus become ionically conducting. In the example given in Aihara et al., the negative electrode is always a Li-intercalation electrode. There is no description of any storing of lithium metal inside the pores of inorganic solid particles. There are also no aspects relating to safety described in Aihara et al. For these additional and independent reasons, claims 11 and 12 are believed to be allowable over the combination of WO 00/44061 and Aihara et al. Accordingly, Applicants respectfully request that these rejections be withdrawn.

Claims 1-13 and 15-23 were also rejected on the ground of nonstatutory obviousness-type double patenting over claims 1-15 of U.S. Patent No. 6,709,789. As

discussed above, independent claim 1 has been amended and, for the reasons described above, amended claim 1 is patentably distinct from the '789 patent. Thus, Applicants respectfully request that the nonstatutory obviousness-type double patenting rejections of claim 1 and claims 3-7, 9-13 and 15-23, which depend from claim 1, be withdrawn.

Claims 1, 3, 5, 13, 15, and 19-23 were also rejected on the ground of nonstatutory obviousness-type double patenting over claims 1-14 of U.S. Patent No. 6,730,441 ("the '441 patent"). As discussed above, independent claim 1 has been amended to include limitations relating to the physical properties of the porous structure. Claims 1-14 of the '441 patent do not recite the structural limitations required by claim 1. While claims 7 and 8 of the '441 patent do recite the presence of a "salt and/or the compound containing a halogen... in solid state in porous structure," amended claim 1 includes further limitations. Specifically, amended claim 1 requires that the material of the "structure-forming solid particles" are made of a "material of which is not an ionically dissociating material (salt)." For these reasons, amended claim 1, and claims 3, 5, 13, 15, and 19-23 which depend from claim 1, are patentably distinct from the '789 patent. Applicants respectfully request that the nonstatutory obviousness-type double patenting rejections of claims 1, 3, 5, 13, 15, and 19-23 be withdrawn.


CONCLUSION

Reconsideration and allowance in view of the foregoing amendments and remarks are requested.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

In the event that this paper is not timely filed, the Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account No. 02-2135.

Respectfully submitted,

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